Medical Team Training Programs in Health Care

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Abstract

Numerous medical team training programs have been developed and implemented in response to the patient safety crisis highlighted by the Institute of Medicine. The role of effective teamwork in accomplishing complex tasks is well accepted in many domains. Similarly, there is some evidence that outcomes in health care may depend on effective team performance. This paper reviews the evidence base for two categories of medical team training: simulator-based programs and classroom-based programs. Specifically, we examine the purpose and strategy of each and then review the reported empirical evidence. In addition, for three of four classroom-based programs we report the results from a series of course observations, curriculum reviews, instructor interviews, and an independent assessment of participant reactions. Finally, on the basis of the evidence reviewed, we present a set of recommendations for how the health care community can develop medical team training in the future.

Introduction

Throughout the health care community, small groups of individuals work together as teams. Physicians, nurses, pharmacists, technicians, and other health professionals must coordinate their activities to make safe and efficient patient care a priority. However, even though a myriad of the conditions addressed by health professionals require interdisciplinary teams, members of these teams are rarely trained together, and they often come from separate disciplines and diverse educational programs.

Given the interdisciplinary nature of the work and the necessity of cooperation among the workers who perform it, it is likely that teamwork plays an important role in ensuring patient safety and avoiding errors. Teams make fewer mistakes than do individuals, especially when each team member knows his or her responsibilities, as well as those of other team members.[1–3] However, simply installing a team structure does not automatically ensure it will operate effectively. Teamwork is not an automatic consequence of placing people together in the same room; it depends on a willingness to cooperate toward shared goals. In health care, shared goals might include maintaining a patient's health status and avoiding errors.

In the Agency for Healthcare Research and Quality (AHRQ) Evidence Report, *Making Health Care Safer: A Critical Analysis of Patient Safety Practices*, Pizzi

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et al., focused specifically on Crew Resource Management (CRM), a sub-domain of team training.[4] These researchers concluded that the application of CRM in medicine has tremendous potential based on its success in aviation. However, they cautioned that additional research is required to establish an evidence base for this health care strategy.

During the last few years, the medical field has developed several medical-team training (MTT) programs, some implemented in the military and some developed for civilian medicine. Some of these programs are specialty-specific (e.g., anesthesia), whereas others are multidisciplinary. Some rely heavily on state-of-the-art simulators, whereas others primarily use classroom techniques. Despite these differences, all are heavily inspired by CRM and share the common goal of reducing the number of medical errors via the application of teamwork-skills training.

The following discussion compares the purpose, strategy, and effectiveness of two distinct categories of MTT: those that are primarily simulator-based and those that are primarily classroom-based. This discussion expands the evidence presented by Pizzi et al.[4] by providing a detailed description of currently available programs. Moreover, we overview the recent results from an independent case study, conducted by Baker et al., involving three classroom-based programs.[5] Data collected from MTT course observations, participant questionnaires, and instructor interviews are reported. Finally, we summarize the state-of-the-science of team training and propose a series of research-based propositions for improving the future of MTT.

Simulator-based programs

We identified two MTT simulator-based programs: Anesthesia Crisis Resource Management (ACRM)[6] and Team-oriented Medical Simulation (TOMS).[7, 8] Both of these programs rely heavily on patient simulators to train specific teamwork skills to physicians and other health professionals. They emphasize what the Federal Aviation Administration (FAA) defines as the "Skills Practice and Feedback" phase (i.e., Phase II) of a CRM training program.

Anesthesia Crisis Resource Management (ACRM)

The value of ACRM resides in its realistic enactment using scenarios of operating room (OR) incidents followed by rapid cycle, learner-centered debriefings using videotapes of the clinical team's performance. Developed by David Gaba and his colleagues at Stanford University and the Palo Alto Veteran Affairs (VA) Medical Center, ACRM is designed to help anesthesiologists effectively manage crises by working in multidisciplinary teams that include physicians, nurses, technicians, and other medical professionals.[9, 10] To facilitate this goal, ACRM training provides trainees with critical incident case studies to review.[11] In addition, ACRM provides training in technical skills as well as team knowledge and skills (refer to Table 1). Training in the selected teamwork skills is intended to enable trainees to learn from adverse clinical occurrences and to work

more effectively with different leadership, followership, and communication styles.[6]

ACRM training takes place in a simulated operating room after the completion of the reading assignments that precede each module. The simulated OR includes actual monitoring equipment, a full-patient simulator, a video station for recording the team's performance, and a debriefing room that is equipped with a variety of audiovisual equipment. The full-patient simulator incorporates a series of complex mathematical models and pneumatic devices to simulate a patient's breathing, pulse, heart and lung sounds, exhaled CO_2, thumb twitches (to assess muscle recovery after administration of paralyzing drugs), and other physiological reactions.[6, 12]

The ACRM curriculum is comprised of three full days of simulation training that occurs over the course of a resident's anesthesiology training. Day 1 provides an introduction to ACRM principles and skills. Day 2 provides a refresher on these skills. It also analyzes clinical events from the perspective of the clinician's technical and teamwork skills and from the perspective of the organization as a larger system. Day 3 emphasizes leadership training, debriefing skills, and adherence to the procedures established to deal with adverse clinical events. Each training module is comprised of a similar structure: pre-assigned readings, course introduction and review of materials, familiarization with the simulator, case study analysis and videotape reviews, and six hours of participating in simulator scenarios. These steps are followed by an instructor-led debriefing and a post-course data collection. Each scripted training scenario is approximately 45 minutes long and each debriefing session lasts for about 40 minutes.[6]

Several instructors are required to run the ACRM training scenarios. They might include a retired OR nurse who role-plays the circulating nurse and an anesthesiologist instructor who role-plays the operating surgeon. In addition, a director monitors and records the simulation from another room, communicating with the instructors via two-way radios. Throughout the simulation, trainees rotate through various roles, such as first responder, scrub technician, and observer.[6]

ACRM training, complete with yearly refresher training, is currently used at several major teaching institutions in the United States and around the world (e.g., Australia, Israel, Denmark). At some centers, ACRM training is offered for experienced practitioners as well as for trainees. Moreover, some malpractice insurers (e.g., Harvard Risk Management Foundation) have lowered their rate structure for ACRM-trained anesthesiologists.[6]

Team-oriented Medical Simulation (TOMS)

The fundamental difference between ACRM and TOMS is the number of participants included in training. Whereas ACRM focuses solely on the responsibilities of the anesthesia crew, TOMS provides interdisciplinary team training to surgeons, nurses, anesthesiologists, and orderlies.[13] The TOMS program, which draws heavily on CRM training from commercial aviation,[11, 14] was developed at the University of Basel in Switzerland.

The first hour of TOMS training consists of a pre-briefing that highlights relevant teamwork concepts such as situational awareness, communication, and decisionmaking. The second hour is devoted to simulated laparoscopic and anesthetic procedures, using a life-like mannequin with live abattoir organs to simulate surgery. The third hour consists of a team-led debriefing that uses videotaped examples of the team's own performance to diagnose problems and identify strategies for improvement.[14]

Simulator-based program effectiveness

A limited number of studies were undertaken to investigate the effectiveness of simulator-based training. Of the studies that have been reported, trainee reactions to the simulation and team behaviors during the simulation have served as measures of effectiveness.

Regarding training reactions, of the thousands who have undergone ACRM training, the majority have evaluated it favorably. Even the "death scenario," which is specifically designed to assess how trainees handle a dying patient, yields positive reactions. Participants have been shown to believe that ACRM contributes significantly to the safe practice of anesthesiology, and these beliefs have been shown to last for up to six months after training. Positive responses have been found to last for up to six months after training.[6] Similar participant reactions have been reported for TOMS, though these results are based on far fewer TOMS-trained individuals.

Regarding team behavior, ACRM and TOMS purport to evaluate a variety of team skills using trained raters who assess specific behaviors representing each skill that was taught in the curriculum.[13, 15] Using a rating scale, trained raters compile their behavioral observations and assign a performance rating to each behavioral skill.[13, 15] For ACRM, r_{wg} values (measures of inter-rater agreement) ranged between .60 and .93[15]; an r_{wg} of .70 is considered sufficiently high to reflect a satisfactory degree of agreement among raters.[16]

Despite these positive assessments, to our knowledge no studies have taken the next logical step of directly investigating the link between team process and patient-safety criteria. In fact, virtually no research has tested the effect of any aspect of simulator-based training on actual performance outcomes. This lack of outcome-related validity derives, at least in part, from the difficulties associated with quantifying the performance of physicians and other health workers.[15]

However, with respect to assessing the effects of team process, the lack of outcome-related validity cannot be explained so easily because programmed outcomes are embedded into the simulator training scenarios (e.g., the "death scenario"). Thus, we believe that developing measures to assess the effectiveness of teamwork in facilitating positive outcomes and in successfully managing, if not avoiding, negative outcomes would constitute a constructive focus for future research. Furthermore, given the current state of simulation, devising training scenarios for which the outcome is contingent upon the level of trainees' demonstrated teamwork skills might also be worthwhile. The FAA-sponsored

Advanced Qualification Program (AQP) has adopted this strategy. Airline captains and first officers are certified to fly during a line operational evaluation (LOE) upon attainment of a full complement of technical and CRM skills.

Classroom-based programs

We identified four MTT classroom-based programs—MedTeams™, Medical Team Management (MTM), Dynamic Outcomes Management© (DOM, renamed Lifewings™), and Geriatric Interdisciplinary Team Training (GITT)—from a comprehensive review of the literature (refer to Baker et al. for a detailed explanation as to how this search was conducted).[17] These programs rely primarily on classroom-based instructional strategies (e.g., lectures, video demonstrations, role plays, etc.) and focus on what the FAA defines as the "Awareness" phase (i.e., Phase I) of CRM training. However, each course makes provisions for follow-up skills practice (i.e., Phase II) and recurrency training (i.e., Phase III). In the cases of MedTeams, MTM, and DOM, we were able to conduct in-class observations and instructor interviews. We also collected information on student reactions. Below, we describe the purpose and strategy of each program and provide information on the effectiveness of classroom-based training based on the available research and our findings from our case study investigation.[5]

MedTeams™

The primary purpose of MedTeams is to reduce medical errors through interdisciplinary teamwork. MedTeams was initially developed by Dynamics Research Corporation (DRC) for emergency departments (EDs) on the premise that most errors result from breakdowns in systems-level defenses that occur over time.[18] According to the MedTeams ED curriculum, each team member has a vested interest in maintaining patient safety and is expected to take an assertive role in breaking the error chain. MedTeams defines a core ED team as a group of 3–10 (average = 6) medical personnel who work interdependently during a shift and who have been trained to use specific teamwork behaviors to coordinate their clinical interactions. Each core team includes at least one physician and one nurse. A coordinating team, tasked with assigning new patients to the core teams and providing additional resources as necessary, manages several core teams.

MedTeams training was developed from an evaluation-driven course design. Based on needs-analysis data, DRC identified five critical dimensions that were necessary for effective teamwork (Table 1). Then, they identified 48 specific, observable behaviors that were linked to these dimensions and constructed Behaviorally Anchored Rating Scales (BARS)[19] for each behavior. Finally, to establish its content validity, they reviewed and refined the curriculum during three five-day expert panel sessions that included ED physicians and nurses from 12 hospitals of various sizes.[20] Expert panel review and modification of the curriculum has been used to create Labor and Delivery (L&D) and Operating Room (OR) versions of MedTeams.

MedTeams uses a train-the-trainer approach to implement the training. Individuals, designated by their facility, receive comprehensive training on how to teach MedTeams and are certified as MedTeams instructors. The course consists of an eight-hour block of classroom instruction that contains an introduction module, five learning modules, and an integration unit. After completing the classroom training, DRC reports that each team member participates in a four-hour practicum that involves practicing teamwork behaviors and receiving feedback from a trained instructor. Coaching, mentoring, and review sessions are also provided during regular work shifts.[20]

Table 1. Team knowledge and skills taught in MedTeams™, DOM, and MTM

MedTeams™	DOM	MTM
Maintaining team structure and climate	Team management	Situation awareness
Problem-solving skills	Recognizing adverse events	Operating strategy
Execution of plans and management of work load	Communications	Communication
Communication skills	Decision making	Command authority
Team improvement skills	Distribution of workload	Workload performance
Knowledge of the components of teamwork	Debriefing	Resources
Situation awareness		Policy/regulation

DOM=Dynamic Outcomes Management
MTM=Medical Team Management

Medical Team Management (MTM)

The Air Force developed MTM training specifically in response to an incident at an Air Force facility in which poor teamwork led to a neurologically impaired newborn.[21] Similar to MedTeams, the primary purpose of MTM is to reduce medical errors, in this case by teaching human-factors concepts to interdisciplinary teams of medical professionals.[22, 23] A secondary purpose is to change the military's traditional medical culture, which focuses on individual performance, an emphasis that creates communication barriers. In contrast, MTM specifically fosters a culture that values team performance and encourages effective communication.[22] Its theoretical position is that this new culture will facilitate teamwork, thereby reducing errors.

The MTM training program has two major components: a three-day train-the-trainer course and a medical treatment facility course. Upon completing the train-the-trainer course, graduates return to their respective medical facilities to train the remaining staff in teamwork principles.[21] The MTM curriculum includes an introduction to the program, overviews of key patient safety and CRM issues, and

specific modules for seven team skills (Table 1). Case studies, vignettes, and tools are interspersed throughout the curriculum to reinforce the importance of effective teamwork.

In 2001, the Air Force Surgeon General mandated MTM training for all high-risk specialties: emergency departments, operating rooms, obstetric departments, intensive care units, and neonatal care units.[21] As of February 2003, over 2,000 medical treatment facility personnel have received MTM training.[24] Formal evaluation has yet to be done on the effectiveness of MTM.

Dynamic Outcomes Management (DOM) (currently Lifewings™)

The primary purpose of DOM is to increase patient safety, reduce medical errors, and improve the quality of health care by improving trainees' skills in team-building, recognizing adverse situations, counteracting the effects of stress and fatigue, communicating, and decisionmaking. DOM provides interdisciplinary team training to surgeons, nurses, and anesthesiologists. The program draws heavily on CRM training from aviation[25] and was developed by Crew Training International (CTI). CTI (http://www.cti-crm.com) recently renamed DOM Lifewings™ (http://www.saferpatients.com).

DOM, which is quite similar to MedTeams and to MTM, includes 8 hours of classroom-based, interactive training that incorporates facilitated discussion, role playing, case studies, behavior modeling, and knowledge testing.[25] During the 8-hour session, two highly trained CTI instructors (typically former pilots) lead participants through strategies for building an effective team. These techniques include recognition of adverse situations, recommendations for managing conflict constructively, guidance for mitigating the effects of stress, training in decisionmaking skills, recommendations for providing effective performance feedback, and principles for mitigating the effects of fatigue.[25] To reinforce the principles of DOM training, CTI developed a "challenge and response checklist," which trainees are required to use in the OR.

Geriatric Interdisciplinary Team Training (GITT)

The primary purpose of GITT is to create a cadre of well-trained professionals who can leverage the effects of interdisciplinary teamwork to improve geriatric patient care. To this end, GITT provides interdisciplinary team training for physicians, nurses, nurse practitioners, social workers, pharmacists, therapists, and administrators.[26]

GITT, which is also quite similar to MedTeams, MTM, and DOM, includes a full day of team self-evaluation and skills training. The team self-evaluation exercise uses the Strength Development Inventory® [27] to help team members recognize their preferred interpersonal styles. It also uses the Team Signatures Technology® [28] to help each team identify their unique dynamics through describing the team's level of cohesion, leadership, diversity, and other relevant characteristics. Following the self-evaluation exercises, the team members receive

classroom instruction in the principles of effective teamwork, phases of team development, conflict management, leadership, and other factors.[26] A half-day of refresher training is provided approximately one year later.

Data concerning the development and implementation of GITT are limited. Of the original eight teams that participated in GITT (all of which were from geriatric treatment facilities in Rhode Island), only three participated in the follow-up. The remaining five teams had ceased to exist in their original configurations because of administrative reassignments.

Classroom-based program effectiveness

Similar to simulator-based programs, few studies have investigated the effectiveness of classroom-based MTT. An extensive review of the literature produced one study on MedTeams—while another is ongoing—and one study on DOM effectiveness.[17] Because data on the effectiveness of these programs are limited and the studies to date have been conducted by the program developers, AHRQ and the DoD tasked the American Institutes of Research (AIR) with conducting a case study analysis of the three most widely applied classroom-based programs: MedTeams, MTM, and DOM. Here we review the empirical evidence for MedTeams and DOM, and then provide a summary of our case study findings.

Empirical evidence

The one reported evaluation of the MedTeams approach was conducted in the ED, while the one underway is being conducted in L&D.[29] The ED study involved a multi-site, single-crossover, quasi-experimental design.[30] In this study, nine EDs (6 in the experimental group and 3 in the control group) were observed during a 14-month interval that encompassed pre-training baseline measures, the training intervention proper, and post-training evaluations. A suite of 17 process and performance measures was collected. To ensure rating accuracy, all observation-based measures were collected by trained raters, and measures of inter-rater agreement were periodically calculated to ensure that the raters remained calibrated.[30] Finally, because data were clustered, Generalized Estimating Equations (GEE) were used to test the effect of the hospital-level intervention using case-level data. The results suggested that in contrast to the control group, the trained groups showed the following: that significant gains were achieved in teamwork-related knowledge, skills, and attitudes; that the intervention did not increase self-reported task workload; and that the error rate decreased sharply. However, these results may be questioned because the raters were not blind to conditions and EDs were not randomly assigned to experimental and control groups.

The second study is ongoing in L&D units in civilian and military hospitals.[31] Unlike the previous study, in which the EDs chose to participate in either the experimental or control conditions, this study was designed as a Randomized Clinical Trial (RCT). Based on an *a priori* power analysis, 24 hospital L&D units

were randomly assigned to participate in either the experimental or control conditions (up to 12 per condition). Many other aspects of the L&D study mirror that of Simon, et al., with multiple performance measures that focus on patient outcomes, team process, and staff and patient satisfaction.[29]

Regarding DOM, over 160 surgical staff members at Methodist University Hospital (Memphis, TN) have completed DOM training. An evaluation of the hospital found improvements in participants' attitudes toward the importance of teamwork issues in the OR, favorable reactions concerning the usefulness of DOM training, and a 50-percent reduction in the number of surgical count errors. However, the small sample size makes it difficult to generalize the results. Moreover, the lack of a control group makes it difficult to determine whether the training caused these improved outcomes.

Case study results

In the summer of 2003, AIR conducted independent, detailed case study analyses of MedTeams, MTM, and DOM. Case studies were based upon the following: reviews of student and instructor guides, slides, and other audio-visual materials that course developers provided; review of published documents on a specific program's effectiveness; observations of the classroom portion of each of the courses; and the collection of pre-training data on student experiences and expectations as well as new, independent post-training data on student reactions to MedTeams, MTM, and DOM. Finally, for MedTeams and MTM, trained AIR staff conducted one-on-one interviews with instructors who had taught or were going to teach the course.

Collectively, the results suggested MedTeams, MTM, and DOM possess several desirable characteristics. First, these classroom-based training programs employ appropriate adult and active learning techniques to develop participant awareness of team-related skills. Each program uses a variety of instructional media to provide information about specific team skills and to demonstrate the importance of teamwork. Second, each program takes an interdisciplinary, as opposed to a uni-disciplinary, approach to health care training. Typical classes include a mixture of physicians, nurses, technicians, and other heath care professionals. Third, our independent collection of post-training reactions suggests that participants had positive reactions to MedTeams, MTM, and DOM training (Table 2). Participants in each class were asked to independently rate the extent to which they agreed with nine statements about training using a five-point scale featuring the following ratings: 1=Strongly Disagree; 3=Neutral; 5=Strongly Agree. In each case, participants indicated that the training was well organized, and felt that they could use many of the strategies discussed during training upon returning to their jobs. Finally, in the case of MedTeams and DOM, program developers are making an effort to collect data to demonstrate that MTT has an effect on participant attitudes, knowledge, and skills and that these intermediate outcomes can be linked to quality indicators in health care.[29, 30]

Table 2. Trainee reactions to MedTeams™, DOM, and MTM

	MedTeams™ (n=218)		MTM (n=26)		DOM (n=78)	
Item	**Mean Rating***	**Std. Dev.**	**Mean Rating***	**Std. Dev.**	**Mean Rating***	**Std. Dev.**
The training was well-organized.	4.4	0.68	4.6	0.49	4.7	0.72
I am confident that I can perform the tasks that were trained.	4.4	0.58	4.2	0.72	4.4	0.70
I am confident that I understood the training content.	4.5	0.60	4.5	0.59	4.6	0.65
I am confident that I can use the knowledge that I learned on the job.	4.4	0.69	4.3	0.80	4.6	0.68
The training content was appropriate for my department.	4.3	0.72	4.2	0.75	4.4	0.83
Training will help my department improve patient safety.	4.1	0.81	4.1	0.60	4.4	0.83
As a result of this training, I feel more confident about my ability to work effectively in a team.	4.1	0.83	4.2	0.65	4.5	0.73
Training prepared me to work effectively in my job.	4.0	0.82	4.0	0.71	4.4	0.78
Training was an effective use of my time.	3.9	0.95	4.1	0.70	4.4	0.86

*Rating scale: 1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree

DOM=Dynamic Outcomes Management
MTM=Medical Team Management
Std. Dev.=Standard Deviation

Note: Response rate for all courses exceeded 90%.

Nevertheless, classroom-based programs were found to have a number of limitations. For example, except for the ED version of MedTeams, none of the programs was based on a comprehensive pre-training needs analysis. Needs analysis is a critical first step in development of training methods. Such an

analysis uncovers the specific training requirements as well as cultural and other organizational issues that can impact training.[32] Second, even though MedTeams and MTM provide instructors with comprehensive instructor training, our observations found that trained instructors demonstrated great variability in the way they conducted training. For example, regarding observations of MedTeams, classes ranged from three to seven hours, and the quality of this instruction varied greatly. Third, and quite contrary to the positive reactions, several of the instructors and students we interviewed said that there was only a 40–50 percent chance of MTT being implemented successfully. Their major concerns were that the individuals in the operating room do not have enough time to conduct ongoing training, and that the length of the training course and the need for refresher training make it prohibitive. Finally, all of the classroom-based programs presented limited opportunities for participants to receive structured practice and feedback on critical teamwork skills. Moreover, role-plays were the primary instructional strategy used for skills practice. Although role-playing has been shown to enhance specific team skills[1], this strategy seems limited because of the practical constraints associated with the classroom environment and the lack of patient or patient proxy interaction (i.e., the ability to allow all class members the opportunity to receive practice and feedback during a role-play).

Conclusions

In summary, few would dispute the importance of teamwork in promoting safe and efficient health care. Team training began with the introduction of ACRM in anesthesiology and recently proliferated with the publication of *To Err Is Human: Building a Safer Health System*.[33] In this paper, we reviewed six MTT programs that have been implemented in a variety of health care settings. We believe development, implementation, and evaluation of such programs are critical to the evolution of both the science and the practice of MTT. The efficacy of CRM has been established, in part, because CRM has been evaluated throughout its evolution. CRM training was developed interactively—introducing and testing the effectiveness of different strategies—which allowed for the best possible results.[34]

We believe that the medical community could significantly improve MTT by looking to CRM as well as other domains where team training strategies have been developed and have enjoyed great success. In particular, the Tactical Decision-Making Under Stress (TADMUS) project, conducted in the surface communities of the U.S. Navy, produced a number of useful tools and lessons learned that are applicable to health care.[35] Based on our review of MTT programs and the extant literature, we advocate the following recommendations.

First, we recommend that the health care community develop a standard set of generic teamwork-related knowledge, skill, and attitude competencies. Parry defined the term “competency” as a cluster of related knowledge, skills, and attitudes that (1) affects a major part of one’s job (i.e., one or more key roles or responsibilities); (2) correlates with successful job performance; (3) can be

measured against well-accepted standards; and (4) can be improved through training and development.[36] Team knowledge, skill, and attitude competencies would represent the core elements of successful teamwork in health care. A review of the MedTeams, MTM, and DOM showed that many of the principles that are advocated and behaviors that are taught are similar across programs. However, each program advocates somewhat different team knowledge and skills, and these attributes are often at different levels of specification. We believe that developing a core, agreed-upon list that conforms to Parry's definition of competency would be a significant step forward for health care. It would reduce potential confusion as well as begin to establish a common language for describing teamwork in health care.

Second, we recommend that instructional designers look beyond aviation CRM training and leverage all available research and tools (e.g., the tremendous amount of U.S. Navy research on teams) when developing MTT programs. For example, Salas and his colleagues have compiled an extensive collection of principles and guidelines for assertiveness training[1], cross-training[37], stress management training[38], and team self-correction.[39]

Unfortunately, the existing medical team training programs do not appear to have leveraged this body of research. For example, the MTT programs that we reviewed rely almost exclusively on classroom-based or simulator-based training methods, rather than on choosing from a variety of instructional strategies to complement the specific training content. With few exceptions, new advances in training technology—such as computer-based training, low-fidelity simulations, standardized patients, embedded training, and scenario-based training—have rarely been used, despite growing evidence regarding their effectiveness.[40] Recent advances in the training theory—such as the effect of pre- and post-training factors on training outcomes, the effect of practice schedules on skills acquisition and retention, and the critical role of individual differences in shaping trainees' motivation—have similarly been ignored.[40–43]

Third, in addition to gaining traction from the available research on team training, we recommend that future MTT programs address all three phases of a comprehensive team training program: awareness, skills practice and feedback, and recurrence. This approach has been a major factor in the success of CRM as well as in the integration of team skills training throughout pilot professional training. Certainly, one place for health care to start would be to combine best practices from classroom-based (awareness phase) and simulator-based training (skills practice and feedback). We recognize that programs like MedTeams, MTM, and DOM make provisions for skills practice, but the addition of simulator-based training (either using low or high fidelity simulations) would likely be beneficial.

Finally, we recommend that AHRQ develop advisory circulars—much like the Clinical Practice Guidelines, which are developed to treat specific medical conditions—on issues related to team training and error prevention. We believe that human factors-related advisory circulars would go a long way toward

educating the medical community about the importance of MTT for ensuring patient safety and consistency across MTT programs.

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